

Clean Copy of Allowed Claims

1. A gear driving system designing system, comprising:

a computer comprising:

one or more processors;

a memory storing a program logic; and

a display terminal; and

a manufacturing unit connected to the computer;

the program logic comprising:

a setting means for setting one or more gear characteristic values for the gear driving system, the gear characteristic values indicating characteristics of a final gear and a driving gear in the gear driving system for simulation of oscillations in the final gear of the gear driving system;

a calculating means for simulating oscillations in the final gear of the gear driving system, based on the one or more gear characteristic values set by the setting means;

a judging means for judging whether or not the simulated oscillations in the final gear determined by the calculating means are within acceptable ranges;

a setting changing means for changing the one or more gear characteristic values set by the setting means, when the judging means judges that the simulated oscillations in the final gear do not fall within the acceptable ranges;

means for causing said setting changing means, said calculating means, and said judging means to repeat their respective functions until the simulated oscillations in the final gear are judged to fall within the acceptable ranges by the judging means; and

wherein when said judging means judges that the simulated oscillations in the final gear are within the acceptable ranges, the one or more gear characteristic values corresponding to the simulated oscillations are output from the designing system to a manufacturing unit for manufacturing the gear driving system or to the display terminal.

2. The gear driving system designing system as set forth in claim 1 wherein the calculating means includes:

an equation creating means for creating equations of oscillation motion for a predetermined oscillation system in the gear driving system, using the one or more gear characteristic values set by the setting means;

an equation analyzing means for solving the created equations of oscillation motion to determine a plurality of oscillation frequencies and a plurality of oscillation amplitudes of the oscillation system, and

wherein the judging means judges that the simulated oscillations in the final gear are within the acceptable ranges when at least one of the plurality of oscillation frequencies and the plurality of oscillation amplitudes determined by the equation analyzing means falls within its plurality of acceptable ranges.

3. The gear driving system designing system as set forth in claim 2, wherein the oscillation system used in the equation creating means is a gear pair of the final gear and the driving gear of the final gear in the gear driving system.

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7. A computer implemented method for designing a gear driving system comprising:
 - a setting step of setting one or more gear characteristic values, for the gear driving system, the gear characteristic values indicating characteristics of a final gear and a driving gear in the gear driving system for simulation of oscillations in the final gear of the gear driving system;
 - a calculating step of simulating oscillations in the final gear of the gear driving system, based on the one or more gear characteristic values set in the setting step;
 - a judging step of judging whether or not the simulated oscillations in the final gear are within acceptable ranges;
 - a setting changing step of changing the one or more gear characteristic values previously set in the setting step, when the judging step judges that the simulated oscillations in the final gear do not fall within the acceptable ranges; and
 - wherein the setting changing step, the calculating step, and the judging step are repeated until the simulated oscillations in the final gear are judged to fall within the acceptable ranges in the judging step, and

when the simulated oscillations in the final gear being judged fall within the acceptable ranges, outputting the one or more gear characteristic values to a manufacturing unit for manufacturing the gear driving system or to a display terminal.

8. The computer implemented method as set forth in claim 7, wherein the calculating step includes:

an equation creating step of creating equations of oscillation motion for a predetermined oscillation system in the gear driving system, using the one or more gear characteristic values set in the setting step; and

an equation analyzing step of solving the equations of oscillation motion created in the equation creating step, to determine a plurality of oscillation frequencies and a plurality of oscillation amplitudes of the oscillation system, and

wherein it is judged in the judging step that the oscillations in the final gear are within the acceptable ranges when at least one of the plurality of oscillation frequencies and the plurality of oscillation amplitudes determined by the equation analyzing step falls within its plurality of acceptable ranges.

9. The computer implemented method as set forth in claim 8, wherein the oscillation system used in the equation creating step is a gear pair of the final gear and the driving gear of the final gear in the gear driving system.

10. The gear driving system designing system as set forth in claim 1, wherein when the setting changing means causes the changing of the one or more gear characteristic

values set by the setting means, the setting changing means also causes the calculating means to simulate another set of oscillations in the final gear of the gear driving system, based on the changed one or more gear characteristic values and the judging means judges whether or not the simulated oscillations of the another set in the final gear determined by the calculating means are within an acceptable ranges and the setting changing means changes the one or more gear characteristic values, when the judging means judges that the simulated oscillations of the another set in the final gear do not fall within the acceptable ranges.

11. The gear driving system designing system as set forth in claim 10, further comprising an output means that outputs the one or more gear characteristic values set in the setting means when the judging means determines that the simulated oscillations are within the acceptable ranges or the changed one or more gear characteristic values when the judging means determines that the simulated oscillations of the another set are within the acceptable ranges.

12. The gear driving system designing system as set forth in claim 1, wherein a plurality of gear characteristic values are set by the setting means for the gear driving system.

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14. The computer readable storage medium as set forth in claim 21, wherein said simulating an oscillation includes:

creating equations of oscillation motion for a predetermined oscillation system in the gear driving system, using the one or more gear characteristic values set by the setting, and solving the created equations of oscillation motion to determine a plurality of oscillation frequencies and a plurality of oscillation amplitudes of the oscillation system; and judging the oscillations in the final gear as being within the acceptable ranges when at least one of the determined plurality of oscillation frequencies and the determined plurality of oscillation amplitudes of the oscillation system falls within its plurality of acceptable ranges.

15. The computer readable storage medium as set forth in claim 14, wherein the oscillation system used in the equation creating is a gear pair of the final gear and the driving gear of the final gear in the gear driving system.

16. The computer readable storage medium as set forth in claim 21, further comprising instructions for:

causing said simulating to be repeated to simulate another set of oscillations in the final gear of the gear driving system, based on the changed one or more gear characteristic values;

causing said judging to be repeated to judge whether or not the simulated oscillations of the another set in the final gear are within an acceptable ranges; and

in the case where it is judged that the simulated oscillations of the another set are not within the acceptable ranges, changing one or more of the gear characteristic values.

17. The computer readable storage medium as set forth in claim 16, further comprising instructions for:

in the case where it is judged that the simulated oscillations of the another set are within the acceptable ranges, outputting the changed one or more gear characteristic values on which the simulated oscillations of the another set were based to a manufacturing unit for manufacturing the gear driving system or to a display terminal.

18. The gear driving system designing system as set forth in claim 2, wherein the judging means judges that a simulated oscillation in the final gear is not within its acceptable range when both of the oscillation frequency and the oscillation amplitude of that simulated oscillation are determined to be outside their acceptable ranges.

19. The computer implemented method as set forth in claim 8, wherein the judging step judges that a simulated oscillation in the final gear is not within its acceptable range when both of the determined oscillation frequency and the determined oscillation amplitude of that simulated oscillation are determined to be outside their acceptable ranges.

20. The computer readable storage medium as set forth in claim 14, wherein said judging includes:

judging that a simulated oscillation in the final gear is not within its acceptable range when both of the determined oscillation frequency and the determined oscillation amplitude of that simulated oscillation are determined to be outside their acceptable ranges.

21. A computer readable storage medium comprising computer executable instructions which when executed on a computer perform a process for designing a gear driving system, the medium comprising instructions for:

setting one or more gear characteristic values for a gear driving system, the gear characteristic values indicating characteristics of a final gear and a driving gear in the gear driving system for simulation of oscillations in the final gear of the gear driving system;

simulating oscillations in the final gear of the gear driving system, based on the one or more gear characteristic values set by said setting;

judging whether or not the simulated oscillations in the final gear are within acceptable ranges;

changing the one or more gear characteristic values previously set, when it is judged that the simulated oscillations in the final gear do not fall within the acceptable ranges;

wherein said setting, changing, simulating and judging are repeated until the simulated oscillations in the final gear are judged to fall within the acceptable ranges, and

when said judging judges that the simulated oscillations in the final gear are within the acceptable ranges, outputting the one or more gear characteristic values to a manufacturing unit for manufacturing the gear driving system or to a display terminal.

22. The gear driving system designing system as set forth in claim 1, wherein:

the gear characteristic values include at least one of (i) number of teeth, (ii) module, (iii) twist angle, (iv) pressure angle, and (v) tooth width of each of the final gear and the driving gear of the final gear.

23. The computer implemented method as set forth in claim 7, wherein:

the gear characteristic values include includes at least one of (i) number of teeth, (ii) module, (iii) twist angle, (iv) pressure angle, and (v) tooth width of each of the final gear and the driving gear of the final gear.

24. The computer readable storage medium as set forth in claim 21, wherein:

the gear characteristic values include at least one of (i) number of teeth, (ii) module, (iii) twist angle, (iv) pressure angle, and (v) tooth width of each of the final gear and the driving gear of the final gear.

25. Canceled.